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Via Cellerese, 33  
I-50013 Campi Bisenzio Firenze(IT)(72) Inventor: Giuliani, Marcello  
Via Cellerese, 33  
I-50013 Campi Bisenzio Firenze(IT)(74) Representative: Mannucci, Gianfranco,  
Dott.-Ing.  
Ufficio Tecnico Ing. A. Mannucci Via della  
Scala 4  
I-50123 Firenze(IT)

(54) A carding machine having fixed caps with elastic yielding, inclination adjustment, and a lower carding grid.

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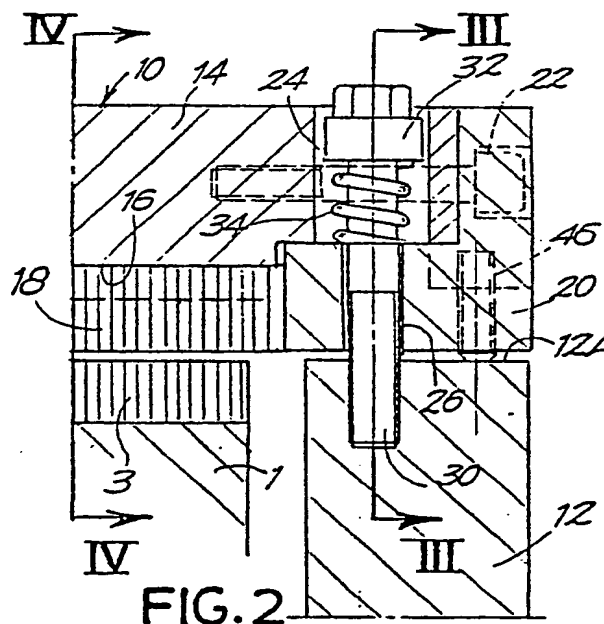


FIG. 2

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## EUROPEAN SEARCH REPORT

Application number

EP 86 83 0069

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 286 357 (J.E. HARRISON) * Front page; column 3, lines 7-68; column 4, lines 1-18; figures 2-5 *	1	D 01 G 15/24
A		3, 5, 6, 12	
A	--- US-A-4 001 917 (R. TAYLOR) * Front page; column 4, lines 7-68; figures 1, 5, 6 * -----	1, 5, 12	
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			D 01 G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09-10-1987	Examiner MUNZER E.
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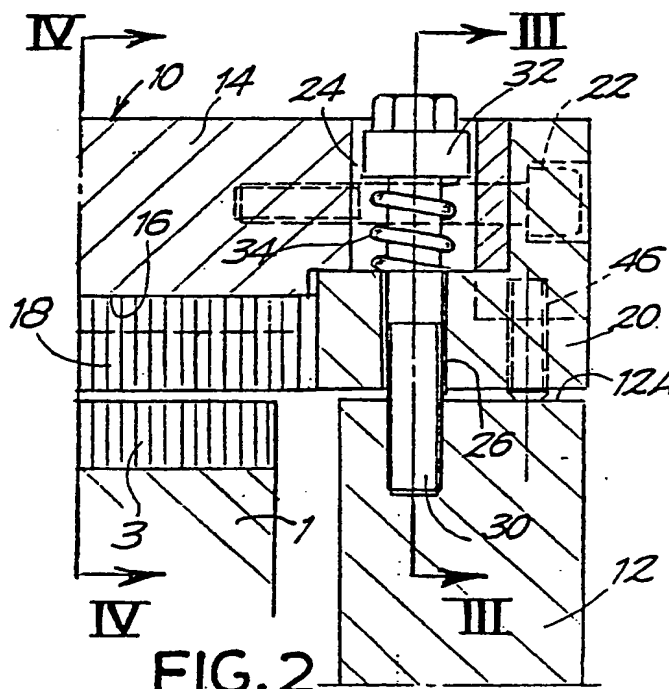


FIG. 2

# "A CARDING MACHINE HAVING FIXED CAPS WITH ELASTIC YIELDING, INCLINATION ADJUSTMENT, AND A LOWER CARDING GRID"

The invention refers to cards for the textile industry both for cotton and for wool as well as for synthetic, handicraft, natural, or regenerated material.

In the present-day solutions the main drum of the card is partly surrounded by a plurality of plates or caps which cooperate -through their inner clothings -with the peripheral clothing of the drum. The use of cards gives rise to the problem of cleaning the cap clothings, respectively to that of avoiding a heap of waste in the clothings and the problem of the adjustment to avoid a fibre deterioration due to an excess of breakings. There is also the need possibly to avoid deformations of the cap and the consequent irregular working in the cooperation between the cap clothing and the drum clothing.

Travelling caps exist at present -especially for cotton cards -which allow a continuous cleaning of impurities possibly retained by the clothing, and the removal of such impurities; these travelling caps are mostly constructed with chain tracks and have mostly continuous motion. Cards also exist with fixed plate or bar caps, secured to the flanks by adjusting means for the so-called "shimming"; these types of caps can be deformed because of inaccuracies of the supports; the deformation causes a change in the interspace between the fixed clothing and the mobile clothing and, hence, a disorder in the clothings cooperation and a poorly satisfactory carding.

The blocked bars or plates tend to break the clotted fibres for separating them with a consequent loss of quality in the material.

Frequently, the cards have -along the periphery of the main carding drum -zones free from fixed clothings, that is, from caps, and intended to eliminate waste and impurities; these zones free from clothings -either closed or open and mostly disposed in the lower part of the drum periphery -are unable satisfactorily to perform their task of removing the impurities, and, in addition, they make the card less functional since a portion of the drum periphery is left out from the operation.

The invention has the purpose to avoid the above mentioned drawbacks by providing a more effective operation, the possibility of a fine, continuous and variable adjustment of the so-called "shimming", that is, of the relative positioning between the fixed clothings and the mobile clothings, the prevention of deformations, and also the possibility of a more effective working of the clots or bunches of unopen fibres without causing fibres breakings or, anyhow, greatly limiting the fibres breaking, with an advantage of the worked material quality; an effective and timely elimination of the impurities as well as the possibility of improving the suction of said impurities are also ensured. These and other objects and advantages will be evident to those skilled in the art by reading the following description.

Substantially, the card according to the invention comprises -for the formation of caps -bars or rods carrying the clothings, which are disposed along the whole circumferential development of the drum and are applied to the flanks by elastic means which allow yieldings of the rod or bar in a substantially radial centrifugal direction with also the possibility of some angular clearance when they are reached by bunches of unopen fibres like waste of rags to be regenerated or other irregularities in the material under work. The lower bars form a carding grid which has the dual function of performing the carding operation and allow-

ing the removal of impurities and foreign bodies. Advantageously, means may also be provided for the inclination adjustment of the clothing surfaces relative to the tangent to the card rotating drum in the application zone.

By this arrangement there is obtained, on one hand, the avoidance of excessive stresses in the bars or plates which yield elastically rather than warping under a bending action as they do in case of a rigid anchorage and, on the other hand, the avoidance of damage in the material under work provoked by too violent an action thereon caused by the fixed and mobile clothings. The possible inclination adjustment by the adjusting means permits the setting every time of the cap bars or rods in the positioning most suitable to the material under work, in any case assuring its transit and work thanks to the elastic yielding, of same bars and protecting the longer fibres.

Practically, each rod or bar for the formation of a cap has, towards its ends and at an offset position in respect to the center line, a screw dowel making up an adjustable pawl for changing the inclination with which the rod rests on the profile of the flank and, at least, an elastic constraint is provided, having guide means, to achieve a possible more or less radial centrifugal displacement as well as an inclination displacement, and elastic means which urge the bar in the centripetal direction, that is, towards the resting surface, with a suitable and even adjustable elastic force. Approximately radial guiding columns may be provided for the elastic yielding of the bars in the centrifugal direction. The elastic means may consist of helical springs or volute springs or the like, which act along the columns axis and may be arranged round the columns suitably provided with a reaction head; the springs may be of metal, rubber or other construction. It is not excluded the realization of elastic means in the form of pneumatic springs in order to obtain in such a way the possibility of an adjustment -even simultaneous -of all the elastic means of all the bars (or groups of bars) surrounding the drum. In case of metal or rubber or similar springs, screw adjusting means may be provided for the adjustment of the reaction head and/or the placement of shims to be interposed between the bar and the spring.

In a practical embodiment, a bar for caps may comprise a beam structure able to engage -through a dovetail or an equivalent means -a number of side-by-side packed plates which form the clothing, and two end supports, that are fastened to the beam ends for clamping the plates, said end supports being provided with the inclination adjusting means and with the elastic yielding application means. The end supports may have, advantageously, a right angle construction. The presence of clothings along the whole drum periphery increases the productivity and the quality; and the lower, spaced apart, bars have also the function of a cleaning grid.

The invention will be better understood by reading the following description in conjunction with the accompanying drawing which shows a practical, non limitative exemplification of the same invention. In the drawing:

Fig.1 shows a portion of a card with the drum cooperating with the caps according to the invention;

Fig.2 shows a partial cross-section view of the card in correspondence of the support of one of the cap bars;

Figs.3 and 4 show sections according to III-III and IV-IV of

Fig.2;

Fig.5 shows a modified embodiment of Fig.4; and

Figs.6 and 7 show two modified embodiments of Fig.3.

According to what is illustrated in the accompanying drawing, first referring to Fig.1, numeral 1 indicates the drum provided in the main part of the card, with clothings 3 that receive the fibres from a feeding cylinder 5 and hand them over to a doffer or detaching cylinder 7, the cylinders 5 and 7 being also provided with clothings of traditional type which fulfil their functions and rotate according to arrows f5 and f7, while the drum 1 rotates according to the arrow f1.

The zones of the drum 1 periphery that are not taken up by cylinders 5 and 7 and other possible operative members are utilized to place caps therein, which caps have a clothing cooperating with the clothing 3 of drum 1. These caps are bars-like developed and generally indicated by 10; the caps are mounted on the flanks 12 of the card - (see Figs.2 and 3) flanking the drum 1 and have a peripheral resting surface 12A having, substantially, the periphery profile of the carding drum 1. The bars are, therefore, disposed along the whole periphery of the drum thereby obtaining a carding action even in the lower zone between the two cylinders 5 and 7; in this zone the bars have also the function of a grid for the removal of impurities and foreign bodies.

Each bar cap 10 comprises according to Figs.2 to 4, a beam 14 which has a longitudinal dovetail groove 16 on the face facing the clothing 3, so as to receive and engage correspondingly shaped appendices 18A of plates 18 making up the clothing of the cap; the plates 18 are packed in a pile along the beam 14 and are tightened against each other by two right-angle developed end supports 20 which are fixed to the ends of beam 14 by screws 22 for clamping the pile of plates 18 of the cap clothings; the ends of beam 14 are so shaped as to cooperate with the end supports 20 and, in particular, have through holes 24 orientated almost radially in respect to the profile of drum 1 and of the resting surfaces 12A of the flanks 12. To the holes 24 of greater diameter, holes 26 of smaller diameter correspond in the lower parts of the right-angle end supports 20. Within the holes 24 and 26, screw stems 30 extend with some clearance, which can be engaged in corresponding threaded holes of the flank 12; each of these stems 30 has a head 32 which forms a reaction support for a corresponding helical spring 34 received in the hole 24 and acting on the corresponding support 20; two springs act, therefore, on the bar of the cap 10 to urge it towards the flank 12. The force of each spring may be adjusted through a proper setting of the head 32 position and/or by the interposition of shims. It is possible to provide to adjust the stem 30 in respect to the flank 12 in order to set the position of the head 32 which is solid with the stem; alternatively, the stem 30 may be fixedly engaged to the flank 12 and the head 32 may be adjustable in respect to the stem, suitable lock nuts being possibly provided.

In the modified embodiment of Fig.6 -in which the corresponding members are indicated by the same references -a bush 40 is provided, which can slide relative to the support 20 and is encompassed by the spring 34 while the stem 30 goes through the bush 40 to accomplish the function of guiding and adjusting the spring load; numeral 42 indicates a washer providing support for the spring; in this way the angular adjustment of the stem 30, 32 does not entail an angular stress on spring 34.

In the modified embodiment of Fig.5, the beam 14 has a dovetail projecting part 116 instead of a channel 16 and the plates 118 have each a dovetail indentation instead of the appendix 18A.

In the modified embodiment of Fig.7 two stems 130 are provided instead of one stem only.

In each embodiment, the end supports intended to the bearing of the surfaces 12A of flanks 12 have at least an adjustment screw member 42, with a screw dowel and a possible counterscrew or a lock nut; this dowel 46 makes up an adjustable pawl which is placed at a certain distance from the stem 30, 32 along the surface 12, 12A to allow an adjustment of the bar 10 inclination in respect to the bearing surface 12A and to the tangent of clothing 3, along the zone of cooperation with the clothing of plates 18.

It will be evident from what has been hereinbefore described that each bar 10 is capable of being adjusted at least for the inclination on its own clothing in respect to the clothing 3 drum 1, and is also capable of being lifted almost radially in the centrifugal direction in respect to the clothing 3, with elastic yielding of springs 34.

At each end of a bar two dowels or other adjustable abutments may also be provided that can also allow the distance adjustment of the bar and its clothings as well as the inclination adjustment.

The various bar caps 10 are placed around the drum 1 at a relatively limited mutual distance (see Fig.1) so that they take up or can take up even the whole periphery of the drum, except the zone being occupied by the cylinders 5, 7 and other working members. The bars placement is arranged so as to maintain a limited interspace 48 (see also Fig.4) between the clothings formed by the plates 18 of adjacent bars 10; the impurities can escape through these interspaces and, to this end, (that is to facilitate the impurities removal) at least a vacuum zone -being realized, for example, through a suction unit 50 suitably disposed along the drum periphery -may also be provided.

The compression springs 34 allow the cap to move away from the drum if that is required for any working phase, for example, when a bunch of unopen, that is, packed fibres or waste from regenerated rags, enters the machine. As the caps are elastically movable, each cap moves away as far as it is able to single, that is, to separate, each fibre without breaking it and protecting the clothing both of the drum and of the caps against a rapid wear. The slight pressure on the cap allows the fibres to be put perfectly parallel between them without breaking them, since, at each request of a fibre micromovement, the cap adapts itself to these micromovements by protecting the fibre against any breaking or notch formation, by increasing the slipperiness of the fibres and the resistance of the yarn.

The same thing occurs when some impurities are present; if it is a matter of small "shells", they are removed with gentleness, if there are other impurities having a slight pressure movement, both the clothing of the drum and the one of the cap are protected against deterioration. Another important function of the invention is that to prevent the blocking of the cap on its own adjustment means, in order to avoid the bending of the cap and, consequently, a non perfect shimming between the cap and the carding drum along the bar; the caps according to the invention -as they are not blocked by screws but only urged by the spring -do not undergo any deformation and thus remain perfectly straight. They permit a constant working throughout the work width of the card. The cap, owing also to the possible side register for the inclination, allows to vary the working degree thereof. Each cap is provided with plates which do not leave interspaces between a bar and another, which

interspaces would create heaps of fibrils together with the unavoidable formation of "neps", thereby deteriorating the quality of the worked material. The shaping of the cap permits also to leave interspaces 48 between adjacent caps in the lower zone and gives the possibility to put the machine under depression. Through the caps according to the invention it is possible to form a succession of caps for a carding operation as far as 360° of the drum periphery and therefore, this system allows to eliminate the sheet grid under the card, that will be replaced by a group of carding caps, preferably spaced from each other and thereby performing the carding besides functioning as a grid. This system permits, therefore, the creating of cards with drums of smaller diameter still obtaining the same carding as with the present-day drums which have much greater diameter. The drums, as they are smaller, make many more runs to reach the carding peripheral velocity and thus permit the launching of all the fibre impurities into the suction zone without the intervention of special cleaning means, all this being achieved because of the special shape of the cap bar. Besides, the drums having smaller diameter are more economical, absorb less energy and permit the performance of stops rapid and advantageous under the prevention accident aspect. Thermal warping is smaller. No special cleaning means of known type permits the fibre to escape fully cleared from impurities, whereas the cap being "mobile" and having a special shape, according to the invention, allows the achievement of a perfect cleaning of the fibre through the interspaces between the bars, and, therefore, it is possible to apply bar caps through 360° of the drum perimeter in all types of cards for cotton, wool, chemical, artificial fibres and for regenerated and combed fibres, and in the cards assortment.

It is understood that the drawing shows an exemplification given only as a practical demonstration of the invention as this may vary in the form and dispositions without nevertheless departing from the scope of the idea on which the invention is based.

#### Claims

1. A card with fixed caps, characterized in that it comprises -for the formation of caps -bars or rods carrying the clothings which are disposed along the whole periphery of the drum and are applied to the flanks by the intervention of elastic means which allow yieldings of the rod or bar in a substantially radial centrifugal direction.
2. Card according to claim 1, characterized in that it comprises also adjustment means for the inclination of the clothing surfaces in respect to the tangent to the rotating drum of the card in the application zone.
3. Card according to claim 1 or 2, characterized in that each rod or bar for the formation of a cap has towards each end, guide means for the possibility of a more or less radial

centrifugal displacement, and elastic means which urge the bar in the centripetal direction, that is, towards the bearing surface, with a suitable elastic force being also adjustable.

4. Card according to claim 2 or 3, characterized in that it comprises, towards each end at a position offset of the center line, a screw dowel making up an adjustable pawl for changing the inclination with which the bar rests on the flank profile.
5. Card according to the preceding claims, characterized in that it comprises more or less radial columns providing guide means for the elastic yielding of the bars in the centrifugal direction.
6. Card according to the preceding claims, characterized in that the elastic means consist of helical, volute or similar springs which act along the columns axis and can be disposed around the columns being suitably provided with a reaction head.
7. Card according to claim 6, characterized in that it comprises screw adjustment means of the reaction head and/or means for the insertion of shims to be interposed between the bar and the spring.
8. Card according to claims 1 to 5, characterized in that the elastic means are realized in the form of pneumatic springs so that to obtain the possibility of a simultaneous adjustment of all elastic means of all the bars surrounding the drum or of single groups of bars.
9. Card according to the preceding claims, characterized in that it comprises at each end at least two dowels in order to obtain the adjustment of the radial displacement of the bar in addition to the inclination adjustment.
10. Card according to the preceding claims, characterized in that the bar for caps comprises: a beam able to engage, by means of dovetail profiles or other equivalent way, a plurality of side-by-side packed plates forming the clothing; and two end supports, which are fixed at the end of the beam for clamping the plates and are provided with the inclination adjustment means and with the elastic yielding application means; said end supports being possibly realized in a right-angle form.
11. Card according to claim 1 or the following claims, characterized in that it comprises a suction hood sucking from the spaces between the bars of a group of bars.
12. Card with fixed caps with elastic yielding and inclination adjustment; all as above described and represented for exemplification in the attached drawing.



FIG.3

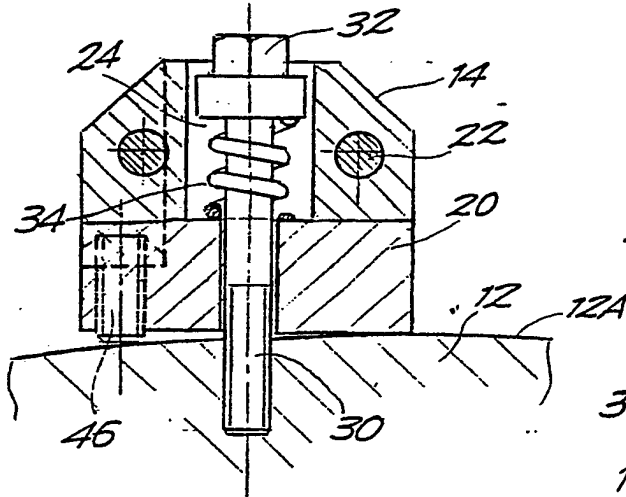


FIG.4

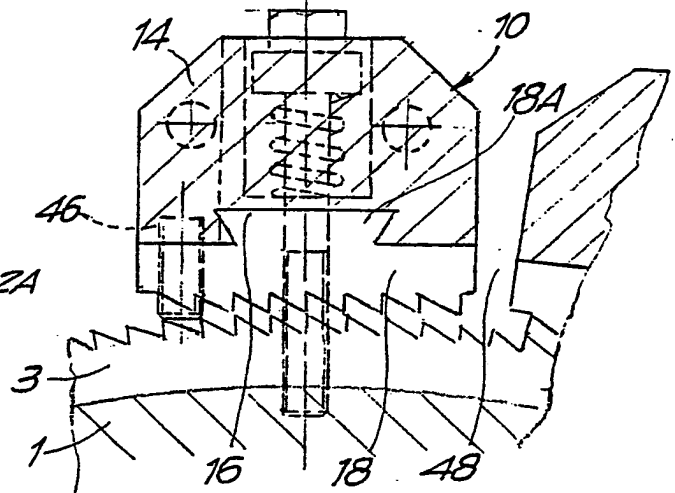


FIG.7

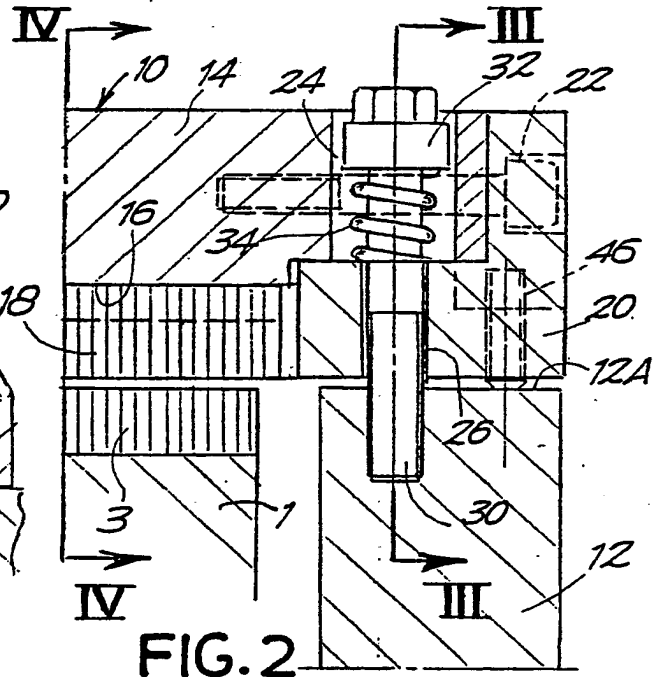
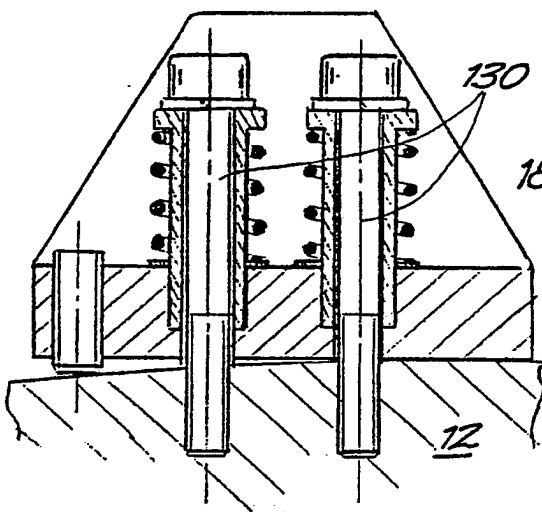


FIG.2

FIG.5

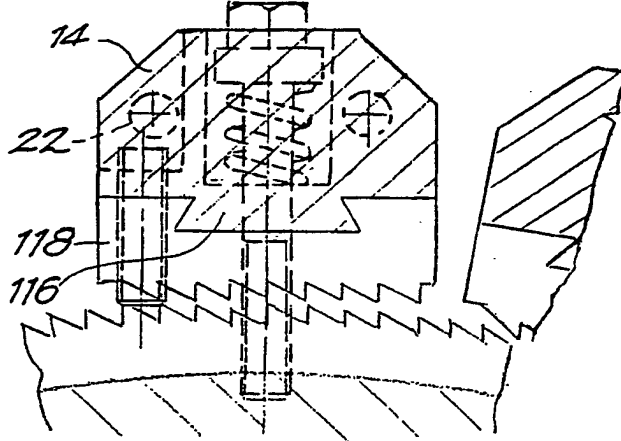
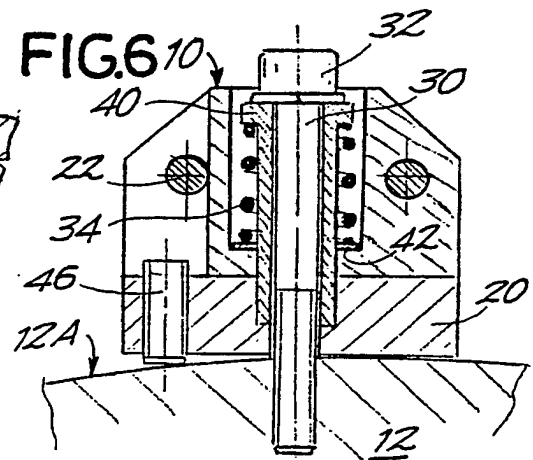


FIG.6





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